European Weapons in China:
Muskets and Cannons in the late Ming (1368-1644) and early Qing (1644-1912) periods

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This paper will analyse the use of muskets and cannons in early modern (16.-18. Jh.) Chinese armies in order to determine the extent to which firearms were applied in military practice, military theory and writings, and in political rhetoric. It will be seen that, like in Europe, muskets and artillery played an increasing role in Chinese warfare in the 16th and 17th centuries. The main difference during the early phase lies in the high professionalization established in fighting units and the production of firearms in Europe, as well as in writings about warfare. With the foundation of the Qing empire in China, muskets and cannons likewise lost their preeminent position in both practice and theory.

Military technology plays an important role in the discussion about the so-called 'military revolution' as an important process leading to the 'great divergence' (Pomeranz)[1] between European or Western countries and the rest of the world, particularly advanced states like the Ottoman and the Mughal empires, or China and Japan.

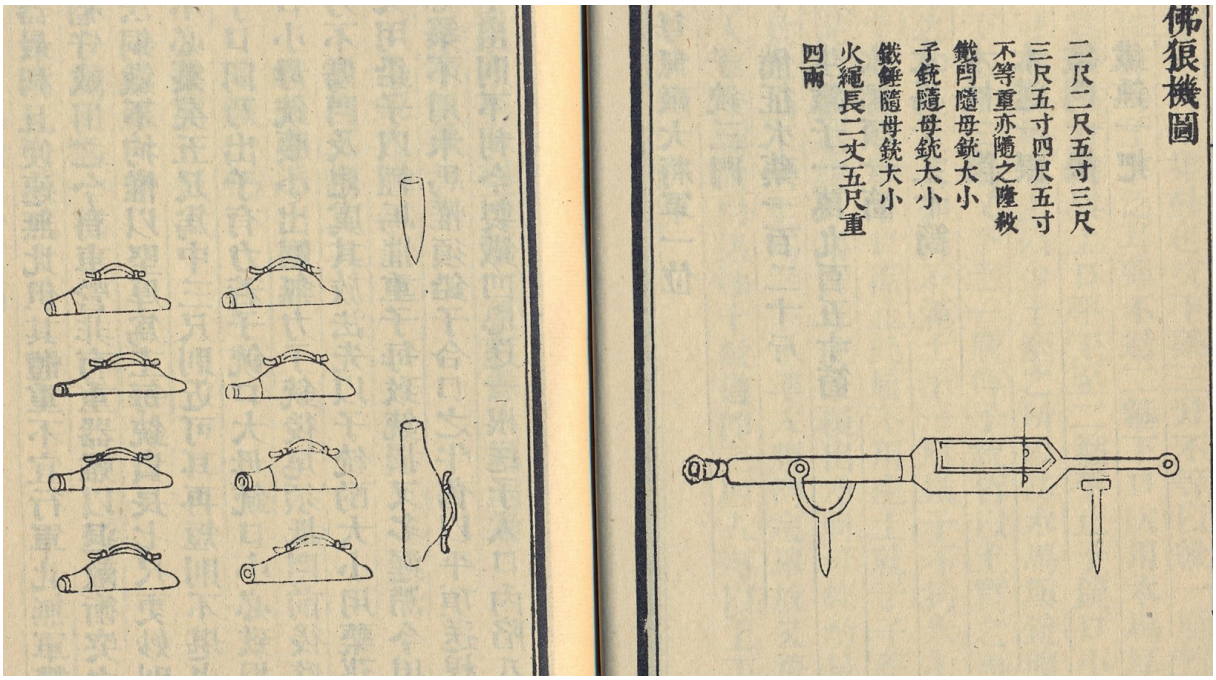


Illustration of a 'Frankish' breach-loading culverine, with magazines to the left, from *Lianbing shiji*.

In his newest book Jeremy Black[2] renounces the proposition that the military revolution was a purely tactical and technological change. Certainly, the change from the block-shaped infantry (musketeer) formation of the *tercio* to a less deeply staggered and broad line of attack played a certain role in European warfare. The same is valid for the development of easily moveable field cannons and the industrial production of cheap and reliable flintlock muskets. Yet these two aspects are not sufficient to explain differences in the development of warfare in Europe and elsewhere. It is necessary to take into consideration the role of the state and the

[1] Kenneth Pomeranz (2000), *The Great Divergence: China, Europe, and the Making of the Modern World Economy*. Princeton: Princeton University Press.
[2] Jeremy Black (2011). *Beyond the Military Revolution: War in the Seventeenth-Century World*. New York: Palgrave.

integration of armies and their personnel into society as a whole. The openness to all groups of society of the European mercenary armies in the 17th and 18th century explains a quick exchange of expertise and technology all over the continent. The large-scale private production of cannons made gun founding a private business in which competition ignited technical inventions and progress. The reliance on credit enabled the European states to invest tremendous amounts of money into belligerent activities and the purchase of expensive weaponry systems like artillery units and ships of the line.

This article will discuss the role of cannons and muskets in China in the 17th and 18th centuries in order to probe their function in the Ming and Qing period armies as a whole. It will be seen that both types of arms were willingly adopted and copied by the Chinese but both the Ming and the Qing governments and commanders, albeit being aware of the immense usefulness of high-quality cannons, did not give artillery the preeminent position it had among Western armies. The same is true for matchlock muskets that were not altered at all until the mid-19th century. Firearms were but one type in a broad range of traditional weapons. Other firearms, like 'flame throwers' or handguns (*pentong*), rockets (*huojian*), grenades or mines seem to have attracted more attention than the musket. Firearms were used in practice, but there are no theoretical writings about gunnery and the musketeer. Practically nothing is known about the production of muskets. As long as Jesuit experts were residing at the court in Beijing they were willing to support the Chinese military with guns—albeit of a mere mediocre quality— and to organise Portuguese gunners, but only in very rare cases. Normally, the Chinese staff had during field campaigns cannons cast on the spot, often with disappointing results. The discrepancy between the quick adaption of firearms and the often ancillary role they played in warfare can only be explained by a complex background composed of political decisions, social conditions, political thought and rhetoric, tactical customs, as well as financial and bureaucratic practice different from those in Europe.

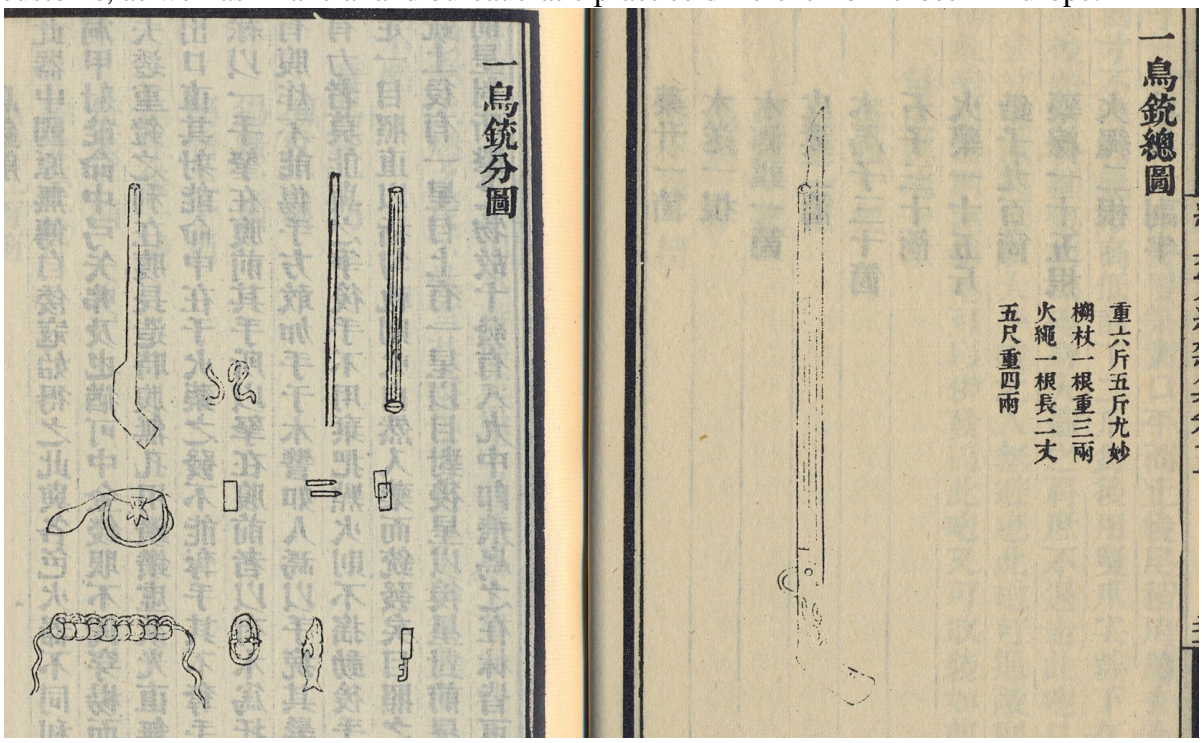
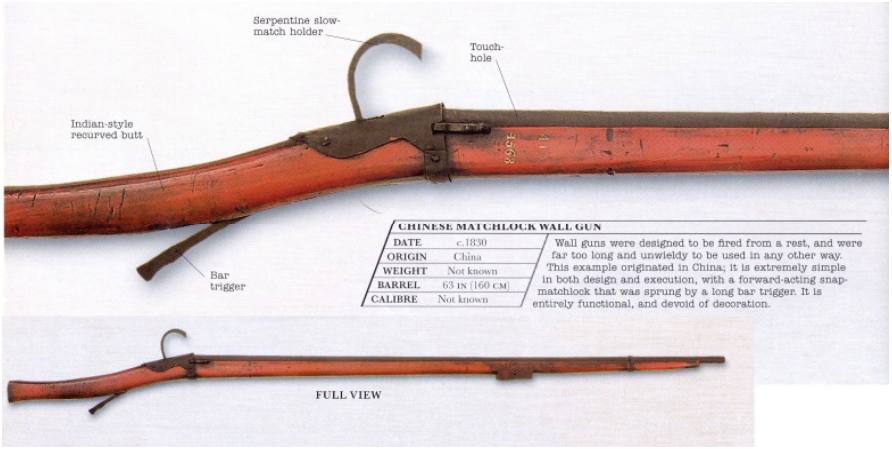


Illustration of a matchlock musket and its single parts, from *Lianbing shiji*.

The Adaption of European Technology by China in the 16th Century

The earliest European firearms reaching China were breach-loaded culverines that were by the Chinese called *folang ji* "Frankish, i. e. Portuguese, machines". According to conventional wisdom, the culverine (small-bore guns mounted on a swivel aboard a ship) came to China in 1523 as booty of two confiscated Portuguese ships. These were soon copied by the Chinese. Yet there is evidence that 'Frankish guns' were already known and used in China as early as 1510 and had the orbit of the Chinese world via Malacca even before the first Portuguese landed in Canton in 1517. The earliest Chinese illustration of such guns dates from 1562 in the book *Chouhai tubian*. Other illustrations of breach-loading naval guns are to be found in Ming period books like *Lianbing shiji* (1568) or *Binglu* (1606). In this book, illustrations and terminology shows clearly Western influence, like a European-type field gun that had found its way with to China the name of 'Dutch' cannon (*hongyi pao*) shortly before.


Serpentine slow-match holder
Touch-hole
Indian-style recurved butt
Bar trigger
CHINESE MATCHLOCK WALL GUN
DATE c.1830
ORIGIN China
WEIGHT Not known
BARREL 63 IN (160 CM)
CALIBRE Not known
Wall guns were designed to be fired from a rest, and were far too long and unwieldy to be used in any other way. This example originated in China; it is extremely simple in both design and execution, with a forward-acting snap-matchlock that was sprung by a long bar trigger. It is entirely functional, and devoid of decoration.
FULL VIEW

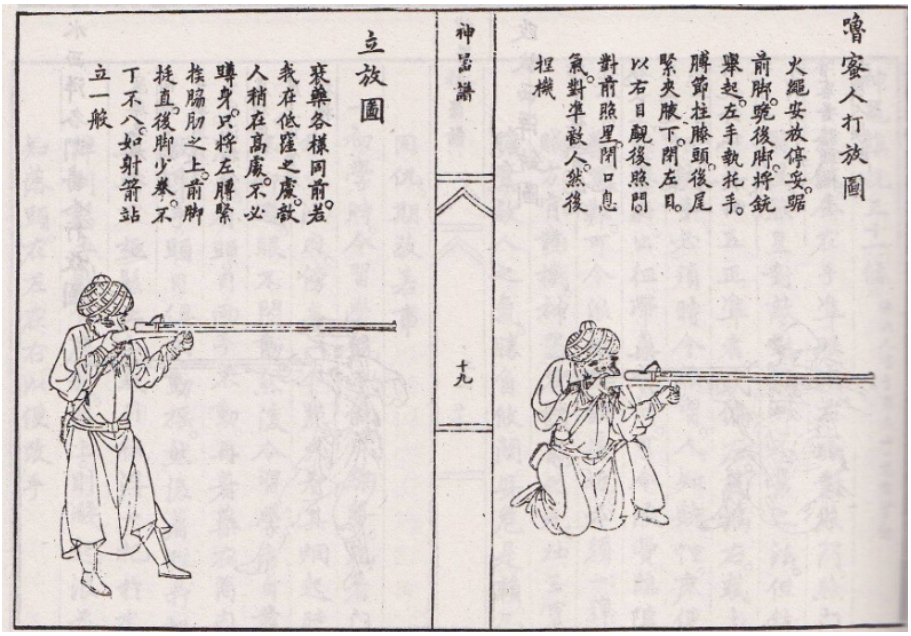
Chinese matchlock wall gun [collector unknown, in Stone, *Guns: a visual history*].

The Chinese had so quickly adapted the use of small-calibre guns that early European observers were convinced that 'the Chinese do use all armour as we do, and the artillery which they have is excellently good'. [3] The use of guns was, nevertheless, restricted to the defence of towns or fortifications along the coastline. The large field cannon also attracted their attention and they began copying it with the designation of 'grand general cannon' (*da jiangjun pao*). The Chinese were fascinated by the usefulness of field cannons and asked the Jesuits to undertake the founding of additional guns and to dispatch cannoneer units in Chinese service against the Manchus in the northeast. Portuguese mercenaries even died for the Chinese cause in the late 1620s and early 1630s. Jesuits in China were to be connected with the issue of artillery throughout the 17th and 18th century. Johann Adam Schall von Bell (1592-1666), a Jesuit mathematician and astronomer, was ordered to advise about the fortifications of Beijing in 1636 and casting cannon in 1642, and Felix da Rocha (1713-1781) was called upon to oversee the barrage of native fortifications in the second Jinchuan war (1771-1776).

The matter of muskets in not as easy as that of cannons. While the origin of cannons in China can clearly be led back to Portuguese influence, muskets were known in China even before Europeans arrived in East or Southeast Asia. This is due to the fact that the Chinese type of musket is derived from a Near Eastern type, which can clearly be seen when comparing Chinese with Turkish, Persian or Indian muskets. The corresponding technology therefore differed from that of European muskets, which can most clearly be seen in the type of ignition mechanism. While the convenient flintlock quickly spread among European armies from the early 1600s, Chinese muskets were equipped with matchlocks even in the mid-19th century. The shape of the Chinese musket itself is also different from the European type: there is a

[3] Juan de Mendoza, 1585, quoted in Joseph Needham (1986), *Science and Civilisation in China*, vol. 5, *Chemistry and Chemical Technology*, part 7, *Military Technology; The Gunpowder Epic*, Cambridge: Cambridge University Press, p. 390.

very short and slim butt, and for better targeting, the musket is equipped with forklike prongs in the fore part of the barrel that serve as a rest when firing. The bipod is so short that, like in a modern light machine gun, it can only be used when lying on the ground or on the parapet of a sap.



Ottoman musketeer, from *Shenqipu*.

The oldest illustration of a kind of match-holder in Europe dates from 1411, the matchlock was fully developed around 1575, with a mechanism in which the smouldering match is held by a cock that snaps forward into the ignition pan with the help of a spring. The wheel-lock was in use around 1530, the flintlock from 1550 onwards. Both types of lock make use of a flintstone that produced a spark when striking a piece of steal on pulling the trigger. The relatively cheap, comfortable and reliable European flintlock was in exclusive use from the early 18th until the mid-19th century when it was replaced by the percussion lock with the caplock mechanism. In European armies, flintlock muskets were a mass product for the infantry units that were ever more improved. Yet excellent quality and advanced technique, like a rifled barrel, were only to be found in cavalry pistols and sporting guns.

Shah Jehan using a matchlock musket, similar to Chinese muskets. [Painting, Chester Library, Dublin, reprinted in Elgood, *Firearms of the Islamic world*].

Traditionally, the adoption of the musket by the Japanese and Chinese is explained as a technological transfer from the Portuguese that happened around 1548. Japanese pirates were said to have obtained muskets as booty, and Portuguese ships were said to have shipwrecked at the Japanese coast in 1543. The use of matchlock muskets quickly spread in Japan and made it such a popular weapon that musketeers were the decisive force in the battle of Nagashino in 1575. Yet the so-called *teppō* hand-guns had arrived in Japan from China as early as 1510. In 1548 the Chinese had already obtained, copied and tested Portuguese muskets. In 1566 the book *Jiangnan jinglüe* gave report of so-called bird-beaked muskets (*niaozuichong*), later shortly called bird muskets (*niaoqiang*). The book *Shenqipu*, finished in 1598,

provides illustrations of muskets and their handling by turban-wearing persons from 'Rome' (Lumi, i. e. the Near East or the Ottoman empire), stating that they used matchlock muskets, too, and probably transmitted these muskets to China even before the Portuguese muskets arrived in Japan and China. In fights with the Muslim polities in the West (modern Xinjiang), the Chinese could have learned from Ottoman matchlock muskets around 1530. They willingly adopted this type of musket and combined the use of it with that common for the Portuguese or European muskets. Illustrations in the *Shenqipu* show that while Orientals used to kneel down when firing and supported the barrel with a special peg, the Portuguese in contrast fired in a standing position and supported the barrel with the bare left hand. The Oriental musket could even be furnished with a breach-loading mechanism, in which several chambers containing bullets and gunpowder could be prepared. A similar breach-loading system was known in Europe in the late 16th century but only used for very rare specimen. The author of the *Shenqipu* claims to have been the inventor of the breach-loading musket. Yet it must be doubted whether in China breach-loading musket was in fact more widespread than muzzle-loading among the common troops. Illustrations in the *Shenqipu* show how to load an Oriental musket with the help of a powder horn and a ramrod from the side of the muzzle. That must, also in Central Asia and China, have been the more common way of loading a musket.

Battle between Manchus (right) using cannon and muskets, and Kalmyks (Dzungars) using muskets only, copperplate engraving [National Library, Berlin].

Technology

Chinese metal-workers started copying the naval culverines and the Portuguese field guns and cast large cannons by themselves. What they were unable to do was to fix the cannons on easily moveable uniaxial carriages that allowed them to be moved over large distances or in mountainous regions. Yet it must be remembered that during the Thirty Years War (1618-1648) in Europe, field guns were still of a considerable weight, showing traces of origin from

the heavy bombards once used against fortifications. Only from the late 17th century on European guns were much more diversified, so that mortars and howitzers could serve to shell fortifications and lighter field guns could be used against infantry.
In China, the war against the rebel Wu Sangui forced the Qing emperors again to seek advice by the Jesuit experts to have cast smaller barrels of bronze instead of iron. The Belgian Jesuit Ferdinand Verbiest had produced 320 field guns during the year 1675. Although some of these cannons survive and are sometimes mounted on 'modern' field gun carriages, illustrations from the 17th and 18th century show that the cannons which the Ming and Qing armies used might have been excellent in threatening the enemy, especially infantry and cavalry units, but were barely moveable. Chinese artillery was a spot weapon brought into the field only under great trouble. Four-wheeled carriages, the backs of camels like in the Ottoman and the Persian empire,[4] or even on the shoulders of porters served to bring guns into position. This was not so important for siege artillery that had to serve in one single place for several days or weeks anyway, but the lack of moving instruments played a great role in campaigns on the move and battles in the field. During operation large guns as well as smaller pieces were sometimes simply laid on the ground, with only a very basic support to help aiming at the target. Others were laid on a square wooden construction, sometimes with small wheels known in Western naval artillery, but often enough also without any wheels at all.
There is a description of a shell in the *Da-Qing huidian tu*, which shows that mortars or howitzers firing grenades were well-known in China. The details of the description are not so clear in some points, for instance, the use of a tin plate as a cover for the load of the mortar, as well as the reason for covering the shell with gunpowder.
In the field of muskets, there were some new inventions made by the Chinese, as we have seen, both in the technique of handling the stock of a musket, as well as in the use of ready-made chambers used for breach-loading. Another field in which the Chinese genius of firearms was very imaginative, are handheld firearms with several barrels as well as the S-shaped serpentine as an ignition tool.
Yet the flintlock was apparently a purely European invention. The Japanese did not learn from it because of the political and economical seclusion from the early 17th century on, and the Chinese because of their 'military conservatism'.[5] Because the number and quality of military treatises in China drastically declined from the mid-17th century on it is not sure when the first flintlock muskets came to the attention of the Chinese. At the point of time when they were described as much more useful than the old matchlock muskets in China, namely shortly after the First Opium War, the flintlock musket saw already its afterglow. Flintstone and its ability to produce sparks when stricken with steel were well known to the Chinese and were applied for the ignition of several firearms like land-mines, but they were never applied for the ignition of muskets. Even when China, in the early second half of the 19th century, began purchasing and producing modern western-style rifles, some factories continued producing matchlock muskets for local use.

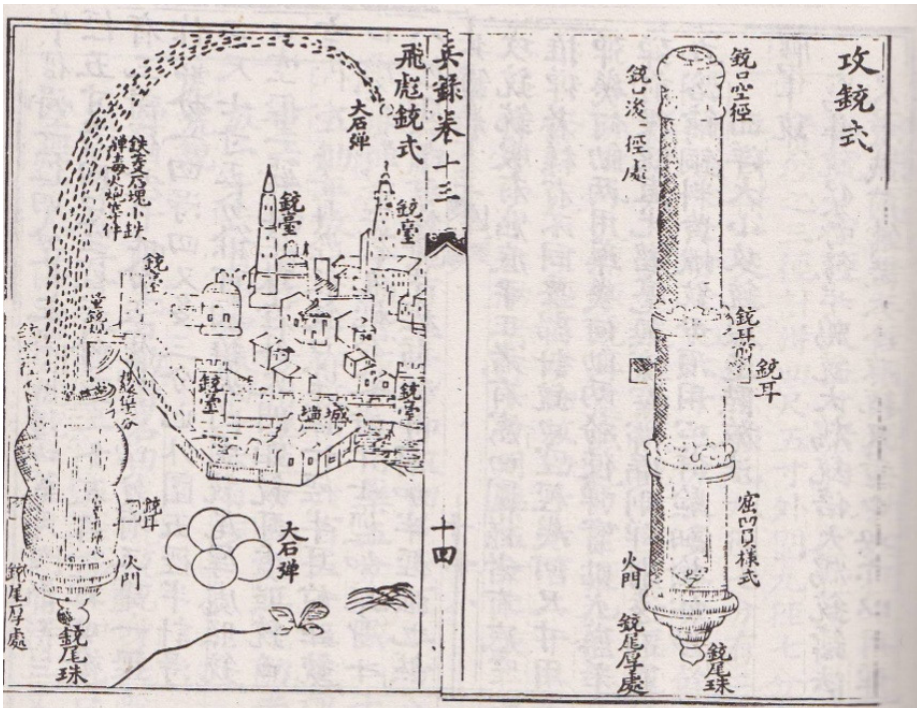
The Theory of Firearms

Chinese military writings have a long history, and the oldest writings, although rather theoretical and sometimes metaphysical, were assembled in a kind of canon during the Song period (960-1279). During that time, the genre of military encyclopaedia came into being, the most famous of which is the *Wujing zongyao* that does not only quote from the ancient classics and does render a picture of the contemporary system of defence and military administration, but also provides its reader with a large amount of illustrations of the most

[4] Michael Axworthy. *The Sword of Persia: Nader Shah, from Tribal Warrior to Conquering Tyrant*. London: Tauris, 2006, pp. 48f.
[5] Needham, p. 465.

recently used weapons, among them not a small number of arms using fire. The tradition of this encyclopaedia is continued until the end of the Ming period, an age in which the military is *ex post* often despised as backless and ineffective. Historical evidence yet shows that the Ming military made use of a wide range of firearms, cannons as well as muskets, rockets and other tools killing or at least threatening the enemy by the use of fire. Several Ming period books are illustrated in order to make easier what the text says about formations of battle arrays or how some noteworthy weapons looked like.

In the book *Lianbing shiji*, for instance, small breach-loading cannons are shown, a 'Frankish' culverine, and a musket, the last two in a compound view and in a view showing all components. This is very interesting because it is the only occasion in which the reader could see how these firearms were made and which parts had to be crafted to produce a copy of the gun. The illustrations are, nevertheless, not sufficiently exact that a craftsman might produce the single components with the help of these samples. This circumstance can be led back to a very different artisanal tradition in China and in Europe. Craftsmen or people from the trades relied on oral transmission, in which a trade was learnt directly from the master and in practice, and not with the help of drawings and books. That group of people making use of books, on the other side, were literati or officials in a civilian or military position that were not expected to handle matters of craftsmen personally. Similarly, no official would enter a mine, whereas in Europe, it was very common that university graduates occupied themselves with hard labour, for instance, as graduate civil servants.



European gun and a trajectory, from *Binglu*.

Some of the Ming period illustrations on firearms are very interesting because they include key parts of the equipment, like one of the earliest illustrations of a screw in the book *Dengtan bijiu*. The screw is one of the few Western inventions that were not known in China. What role a screw plays in the rear part of a musket is, however, not clear, probably as part of a breach-loading mechanism used in Muslim muskets (this device is first shown in the *Chouhai tubian* and then later copied in other military treatises). Another strange device, shown in the *Wubeizhi*, is a rack-and-pinion mechanism with a cog-wheel that must have been part of a lock mechanism not known in Europe and probably also too complicated to have been in common use. The *Shenqipu* shows how to cast and to transport lead bullets, gunpowder bags, as well as a rack holding a welded barrel into which a smooth bore is drilled. Similar illustrations are to be found in the *Binglu*, and this is also the only place in which several illustrations of contemporary European cannons are to be found. These illustrations seem to have been copied from a European book. The *Binglu* is, furthermore, the only

Chinese book that shows the trajectory of a howitzer grenade that is fired upon a city. This is made in a very general style without demonstrating the parabolic nature of the trajectory, and not pointing at any measuring instruments that make possible a calculation how to hit the target. Interestingly enough, the towers of this city look somewhat oriental, more like minarets than steeples or pagodas.

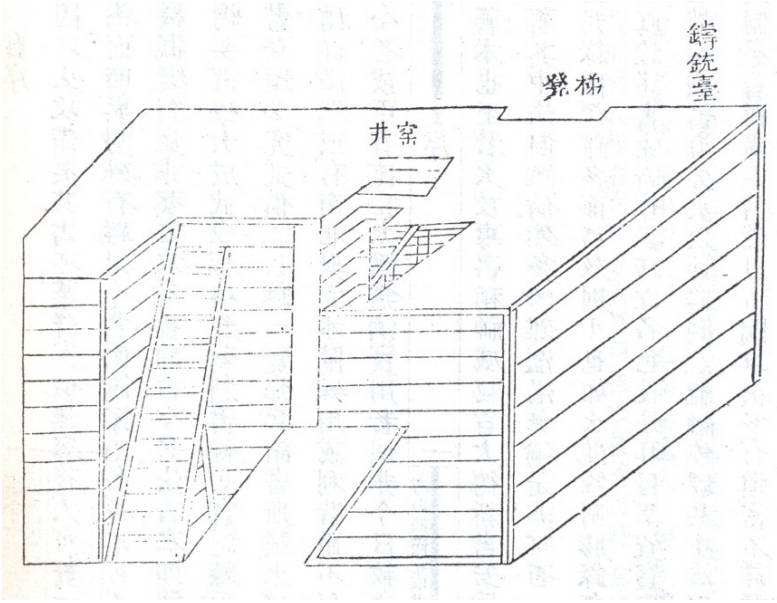


Illustration of a furnace for gun founding, from *Huogong qiyao*.

The large encylcopaedia *Wubeizhi* copies a lot of older illustrations and is a very excellent tool to show that – in comparison to the *Wujing zongyao* five hundred years earlier, technology in warfare did not have made great advancements. Modern firearms only occupy a very small part in the book and give the impression that they did not play a role in late Ming period warfare. Historiographical texts show the opposite case. Although pole arms, bow and arrow, crossbows and swords were important weapons in the Ming army, cannons and muskets were indispensable, especially in defence war. Other firearms like handguns or grenades are also often mentioned in written sources.

The book *Xifa shenqi* is a specialized treatise that describes European cannons, their types, casting, carriages, the shape of artillery bastions, production and types of cannonballs and special ammunition of naval artillery, the production of various mixtures of gunpowder, and implements to load and clean guns. It was written by Sun Yuanhua. The missionary Adam Schall von Bell also wrote a treatise on cannons, the *Huogong qieyao*. This book is richly illustrated (although in a very basic style) and provides information on cannon casting, drilling a bore, cannonballs, the production of muskets, as well as the geometry of ballistics. These two books, written on the background of a more scientific approach to the use and production of firearms, were the most advanced pre-modern treatises on firearms in Chinese language. They are of a new quality of military literature and at the same time therefore virtually put an end to the traditional military treatises of the Ming period. In their general arrangement, these two books are typically Chinese, with illustrations rather serving to loosen up the text than to serve as an object of study. Both authors, Jesuit missionaries, were, although highly educated, not experts in the business of gun founding or leaders of artillery trains, and therefore had to serve themselves from handbooks written by others.

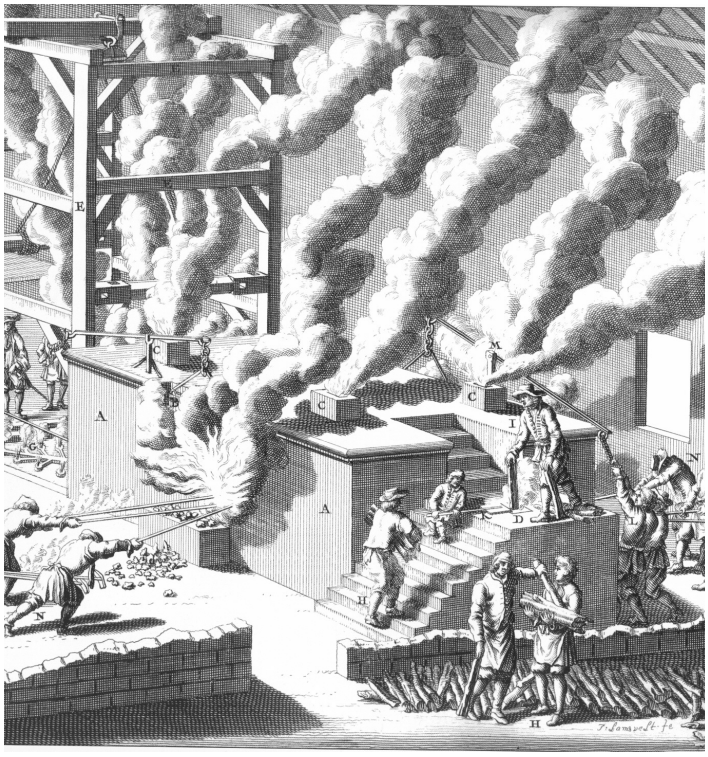


Illustration of European gun founding in de Saint-Remy, *Mémoires d'artillerie* [...] (1741) [repr. in Santi-Mazzini, *La macchina da guerra*].

Firearms in Chinese treatises were described with their physical appearance, like material and weight, and sometimes also with their correct use. It is described how gunpowder was to be made, but not how locks worked, how the complicated process of welding and casting was done, how the enormously effective mass weapon of the musket was integrated into the army together with other types of arms, like pikes, cavalry and field artillery. It is also not shown how exact the dimensions of cannons were in each part of the barrel, but only its length and weight are indicated. All other things were apparently a matter of experience and actual need. It seems that the Chinese who had known a wide range of different firearms for a long time and who had learned of two new types of firearms, one (the musket) from the Ottoman empire and the Portuguese, and the other (artillery) from the Portuguese and the Jesuits, regarded them as just another type of weapon without giving them the same preeminent place they had in the west. Moreover, firearms, like any other type of arm, were seen as a practical tool in waging war, the control of which was left to the gunners and musketeers according to their experience. Gunners and musketeers were seen as craftsmen, whose work, experience and expertise was not worth mentioning in books. Similarly, Chinese military treatises speak a lot of training, personal qualities of commanders and officers, general tactics and tactical decisions according to a set of predefined circumstances, and not of how to operate cannons or how to load muskets.

Illustrations of weapons in Chinese books are quite rare and even these are not very detailed and drawn in a very crude style. There are extremely few illustrations and pictures of actual fighting which does not allow to reconstruct a picture of how a battle looked like. The only exception are the copper plate engravings of 18th and early 19th century Chinese battles and wars produced in Europe. In how far these illustrations are influenced by Western painting, is not sure.

Political rhetoric

The practical use of arms can be influenced by considerations that go beyond the field of effect, cost and handling. The most important factors in this respect are 'knightlyhood' and human considerations, the first, for instance, relevant for arguments against the introduction of the crossbow in Europe, and the second concerning weapons inflicting highly lethal wounds. The first example is also to be found in East Asia, where the musket was, although being an advanced and very effective weapon, was given up in Japan in favour to the sword because it was considered as not sufficiently masculine or heroic. A knight (*samurai*) was much more able to demonstrate his manliness with a weapon like a sword that was used in close-hand fighting man against man and not, like the musket, in large, anonymous and quasi-

mechanical groups. This was only possible because Japan withdrew herself into political seclusion, in which one house, the Tokugawa shōguns, dominated most of the other feudal lords. Another factor allowing this kind of political decision was that the relation of armoured and well-equipped knights to light infantry troops was different from Europe, where infantry played a much greater role in warfare.

Illustration of Kalmyks (Dzungars) using muskets from horseback, and Manchus using the bow, copperplate engraving [National Library, Berlin].

The Japanese example can be extended to China, where the Manchus came to rule who traditionally venerated the bow as the preferable, because more heroic, type of arm. The effectiveness of the bow in combination with cavalry troops is without doubt. It is a weapon that can be used in full gallop with a high hitting rate. A musket can not be used effectfully if a rider is on the move, and even as an infantry weapon the early muskets without a rifled barrel had a relatively low hitting ratio. Bow and arrow were therefore elevated to a national weapon of the Manchus that played a great role in the quasi-ceremonial and repeated exalting of the traditional culture of the Manchus as opposed to that of the Chinese. War was in that respect seen as a continuation of the civil life of the Manchus as hunters and not only seen as a weapon but as an instrument to make one's life, and, of course, for sporting. Bow and arrow were so a counterpart of the musket in Europe, where the best and most advanced pieces were used for fowling and deer hunt.

In a greater context it might even be argued that warfare in Europe was more lethal than in China. In Europe, battles served to annihilate or disable as much fighters of the enemy as possible, while in an environment, where weapons were a dual instrument for sport and war, it might have sufficed to demonstrate superiority by intimidating the enemy by quickness and dense volleys of arrows. Whether this argument has substance or is more a kind of speculation, has to be found out in another place.

Illustration of breach-loading guns used in Jinchuan, copperplate engraving [National Library, Berlin].

A further aspect of political rhetoric is the standardization and codification of all aspects of government, including the military. All garrisons and their size and equipment, as well as types of muskets and cannons (and all other weapons) were fixed in several institutional regulations as the *Zhongshu zhengkao*, the *Da-Qing huidian*, or the *Huangchao wenxian tongkao*. These regulations went so far as to determine the number of soldiers in one garrison and their equipment in a long-term manner. If these regulations are taken literally, the amount of musketry and artillery units in Qing China were extremely few. Yet this does not necessarily mean that there were only as much cannons existent as fixed in the regulations. Figures in other documents show that there were sometimes hundreds of cannons cast in one process, like in the 1630s, when the Ming had to withstand the Manchu assault in the northeast, or in the 1670s, when the Jesuits cast light cannons to help the Manchus subduing the Three Feudatories in southern China.

The political preference of the bow can still be seen in many of the copper plate engravings of 18th century battles. Bow and arrow seem have the same importance in battles than muskets do. At last, the pictures of the campaigns in Dzungharia show that in fact, a very wide range of weapons was used, and several types of guns are shown, yet none of them resembles contemporarian European field guns. Instead, small cannons are lying on the ground, supported by a bedding, or are mounted on a very basic but mostly immobile carriage. In some illustrations it can be seen that cannons were transported on the back of camels. Carriages with one or two axes seems to have been not used in the long-distance campaigns of the west. Pictures showing sieges include cannons with very small wheels, live Western naval artillery. Concerning muskets, it is interesting to see that while the enemy makes use of muskets and employs the effective method of firing volleys as in the West, Manchus (or Qing troops) do rarely use muskets in these illustrations. Similarly, the copper engravings about the second Jinchuan war show almost all Qing troops with sabres and only the highest officers with bow and arrow. Muskets are only rarely seen, and only one light field cannon, lying on the ground, is shown, which contradicts reality because the stone fortresses in the mountains could only be brought down by the heavy use of artillery.

It can be seen that modern or advanced weapons can be given up in favour to seemingly ‘antiquated’ weapons, if it is politically desired and possible. In the Chinese empire it was often possible to dispense with cannons or muskets altogether because they were not needed. In the last phase of the Ming period, it was even the case that the Manchus, only equipped with bow and arrow, were able to defeat the Ming defenders that had musket and cannon at hand, like in the battle of Mt. Sarhū in 1619. This was mainly because the Ming at that point of time did not use how to make use of their superior firepower.

Political will might also have been the reason for the lack of new military treatises in the Qing period. While the Ming is a very productive age of military writings, such are practically absent in the early and high Qing. Needham sees the reason for this circumstance in the long period of peace that revitalized the cultural spirit of China. I dare to doubt that internal peace

was a reason for the lack of military writings. Firstly, because there were many wars during the time regarded, such against external enemies as the Dzunghars or recapture of lost territories like the southwest during the war against the Three Feudatories or that of Taiwan, and such against internal rebellions. In all cases, the experience of the participants might have incited them to author books on the best strategy in these demanding campaigns that requested long-distance logistics and naval capability. Secondly, it seems to me that the Manchus were practitioners instead of theoreticians. They established a new type of historiography for their wars, the military annals (*fanglüe*) that provide immense details of how war was really waged and how certain tactical decisions were made at various levels in the command chain. As a people whose profession it was to wage war (all male Manchus were theoretically expected to become a soldier) they also tried integrating war into the whole progress of administering the empire. War was in the Qing empire a kind of bureaucratic routine and not an *affaire extraordinaire*.

Illustration of Ming guns and Manchu bowmen, from *Manchu i yargiyan kooli*/ *Manzhou shilu*.

Conclusions

It could be seen that the Chinese governments of the Ming as well as that of the non-Chinese Qing dynasty recognized the superior effects of muskets and artillery in warfare and therefore equipped certain units of their armies with these weapons. Yet these units were in battle used in a rather unconcerted manner so that especially muskets lost their efficiency as a weapon delivering lethal volleys towards the enemy. There were, nonetheless, especially during the Qing period, much more muskets in use than political rhetoric pretends. This negligence of firearms was due to a wide range of alternatives Chinese armies had at hand in the shape of the traditional pole arms, bow and arrow (especially used by the Manchus), sabres or various other firearms, but it can also be led back to a lacking need of using destructive weaponry in the face of only 'traditionally' equipped enemies. The enemies China was confronted with were often technically inferior or at

least on par, so that there were no incentives to advance weapon technology. On the other side written reports prove that the Dzungars well disposed of guns and muskets, and other enemies of the Qing troops as well, and that guns were often used to bring down fortified hideouts. Yet generally seen cannons played only a marginal role in siege and were cast ad hoc and in inferior quality. Firearms and their production were not described in detailed technical treatises, and their use was a matter of daily experience in a professional army and was not transmitted to an anonymous public. Practice especially of gunnery was a guild-like secret restricted to professional metal workers labouring for the army, often employees of the provincial mints. Although there are only very few sources about the production of cannons and virtually none about that of muskets, it must be assumed that at least gun founding was a matter of the state and not that of private foundries that were able to experiment and advance quality. The low financial budget of a state not willing to accrue government debt impeded the purchase of large amounts of expensive and sophisticated weaponry. Last but not least, the inclusion of the military into the normal state bureaucracy resulted in very detailed and codified bureaucratic rules (garrison manning, war expenditure, ‘official’ appearance of weaponry) that, if taken literally, substantially impeded any deviations from traditional patterns.